

[DOI: 10.20472/BMC.2016.003.005](https://doi.org/10.20472/BMC.2016.003.005)

**NICOLETTA BASKIEWICZ**

Technical University of Częstochowa, Faculty of Management, Poland

**ANETA PACHURA**

Technical University of Częstochowa, Faculty of Management, Polska

## **HUMAN, LEAN, GREEN CONCEPT AND INCREASING NUMBER OF CONSUMERS - WIND FARM EXAMPLE**

### **Abstract:**

Modern enterprises constantly search for activities aimed at efficiency increase. Between centuries, new system solutions started to emerge, involving manufacturer's responsibility not only for the quality of processes and resulting products. The enterprises have been obliged to take responsibility for the product whole life cycle, for the environment and following rules of sustainable growth. This study aim is to present Human Lean, Green concepts, with their determining factors and presentation of this concept empiric implementation. Because of obvious limitations of this paper only Green concept example will be shown herein. Wind energy generation and use will be used, with its influence on enterprise competitiveness. This thesis will be then verified in terms of proving how renewable energy sources use in a jewellery shop influences growth of potential customers number and whether it is profitable in Polish conditions.

### **Keywords:**

Human Lean, Green concepts, sustainable growth, wind energy.

**JEL Classification:** A10, A12, A19

## Introduction

This study aim is to verify a following thesis: „eco-technologies are the factor increasing competitiveness of an enterprise.” This thesis will be here verified in terms of proving how an investment in renewable energy sources may stimulate competitiveness of a bakery shop and to what extent, considering such indicators as growth of potential customers quantity and profitability. Ecology today is increasingly popular in the society and large number of consumers presents „green” attitude, consciously choosing environment friendly products and stores. European Union also forces Poland to develop its renewable sources, which is related to many conveniences in those processes, such as green certificates, which influence the undertaking's profitability.

### 1. Human, Lean, Green concept

Today's enterprises keep taking attempts to find a way to efficiency, either in organisation, the process and every single work post.[Janikowski, 2004, p. 117; Adamczyk J., Nitkiewicz T., 2007, p.79] In the end of last century, an example of Japanese enterprises was taken in order to implement a model of supreme quality. [Liker J.K., Convis G.L., 2012, p. 45-65; Liker J.K, Meier D.P., 2011, p.128-137] This example helped to introduce an activity focused on cost efficiency and limiting waste of time and resources in following situations: additional expenses for repairs, remakes or complaints. That time ISO compliant quality system was a sign of competitiveness in Poland. In following years, systemic solutions significance grew considerably, where responsibility of enterprises was no more limited to quality of product and production process. This responsibility has been extended to the product whole life period, including its disposal, recycling, reuse, responsibility for the environment and human resources – as a key resource of any organisation. [Adamczyk J., 2009, p. 67; Majecka B, 2005, p.185] Exchanging functional approach with process oriented one. Stimulated joining solutions enabling the achievement of various aims within one system: zero defects, zero faults, zero contamination.[Zabłocki G., 2003, p.32] Consequently, this led to emerging such hybrid concepts as Human Lean Green.[Dolliver M., 2010; Engardio P., 2007]

### 2. Renewable energy sources in Polish and European policies

In December 1997 first renewable energy regulations appeared, signed by the European Parliament. They have been called The White Book – „Energy for future- renewable energy sources” created by an European Commission organised particularly for that purpose. Following documents appeared four years later, as a Directive 2001/77/EC, on assistance provided for the production of renewable energy, which determined certain level of renewable energy in total power consumption in EU till 2010. This directive was then replaced in 2009 with a new one no. 28/2009/WE. Gas crisis (due to Ukraine's stopped delivery in 2006) caused further and increasing interest in alternative power generation raw materials providers.[Fijak M., Gorgoń P., 2014, p. 243] Then The Green

Book was created containing strategic opportunities on competitive, safe and sustainable energy policy. Six areas to be focused on have been selected:

- Common, consolidated energy policy of all member states;
- Introduction of renewable energy sources innovations;
- Providing energy competitiveness and safety;
- Climate changes;
- Building gas markets between the member states;
- Internal solidarity and unified energy foreign policy<sup>1</sup>.

Following projects appeared in January 2007 in the announcement of EU, in which special emphasis was put on consolidation of energy policies of all member states, as it was also admitted, that previous directives failed to decrease gas emission. [Mesjasz-Lech, 2015, p.132] It was assumed, that till 2030 the atmosphere would contain even 5% of carbon dioxide more than in previous period and energy fuels import from outside EU could increase even to 60%. It is prognosed, that oil import dependence may increase up to appr. 90%, and natural gas – up to 85%. The European Commission is unable to figure out any solution to meet the energy demand, which unfortunately, will affect economy (higher power prices) and politics. [Konarzewska A., 2006]

19.10.2006 was the date, when „Energy Efficiency Action Plan” was implemented, the aim of which was decrease traditionally generated energy consumption by 20 % till 2020 and reduce carbon oxide emission (IV) by 780 mln tonnes per year (27 EU states have signed the agreement). Such reduction would cause savings up to 100 bln euro yearly. Power consumption reduction was supposed to be related to low power equipment, public transport improvement and social awareness increase. Each government was obliged to implement these procedures to achieve the above aims.

The most important Polish energy policy aspects are the following:

- Renewable energy sources growth in final power consumption, which means even 15% till 2020 and more in following years. Increasing biofuels share in transporting by 10% till 2020, including 2<sup>nd</sup> generation biofuels;
- „Protection against excessive deforestation in biomass acquiring process and sustainable use of agricultural areas for RES, such as biofuels, in order to prevent competition between renewable energetics and agriculture as well as in order to preserve biological variety,
- Using the State's energy storage devices for power generation.

---

<sup>1</sup> The Green Book European Strategy of Sustainable, Competitive and Safe Energy, [www.cire.pl](http://www.cire.pl).

- Increasing diversification of delivery sources in order to create optimised conditions for dispersed energetics based on local resources<sup>2</sup>.

### 3. Wind farm as an example of eco-technology

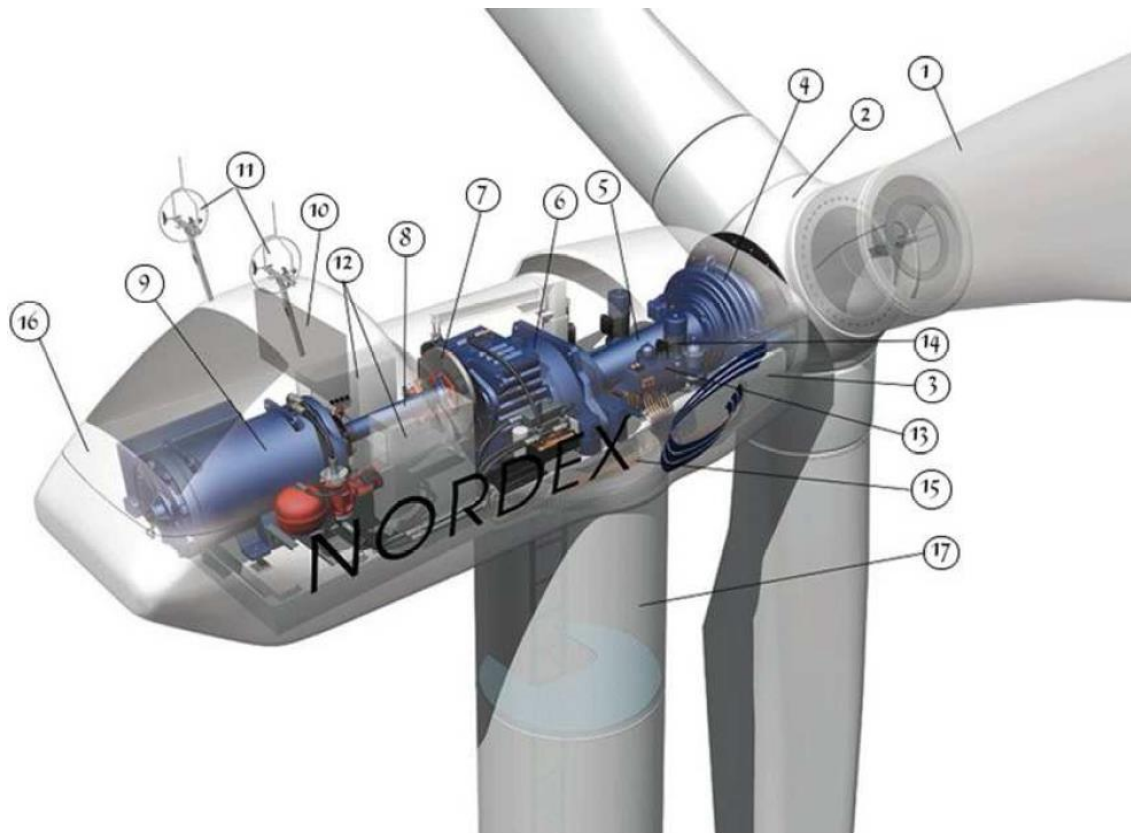
Wind farms are certainly the examples of green technology, as the energy here is generated by wind acting on rotor blades. Wind is a natural and renewable energy source and it is free, which makes this a perfect fuel for the power generation turbine. Wind farms consist of rotors and gondolas assembled on towers. The rotor transforms kinetic energy to mechanical one.

We can select four types of rotors: single-, double-, triple-, and multiple-blade ones. The most popular are triple-blade ones, usually made of glass fibers coated with poliester reinforcement. Triple-blade mechanism advantage is stability and torque constant value. Single-, or double-blade rotors are more rare, but also generate more noise and they need much more rotation speed to function properly. [Das J.C., 2015, p.467]

The rotor is assembled on a shaft, which activates the generator. Gearbox is necessary, since rotation speed increase is certain. The rotor hub contains a servomechanism designed to change the blades angle. As the gondola needs to be directed against the wind flow, it needs to have 360° range. Gondola control in household power stations (where its size is rather small) is made a yaw plate. Moreover, gondola contains (except such standard parts as generator, high-speed and low-speed shafts and gearbox) such components as: transformer, bearings, lubrication systems and brake, responsible for rotor emergency stop.

---

<sup>2</sup> Poland's Energy Policy till 2030.

**Figure 1. Wind power station gondola**

„1 – rotor wing, 2 - blade, 3 – bearing structure, 4 – rotor support (bearing), 5 – drive shaft I, 6 - gearbox (3 gears), 7 – brake disc, 8 – drive shaft II, 9 – generator, 10 – generator and gearbox cooling system, 11 – wind measurement system (anemometer, flag), 12 – control system, 13 – hydraulic system (brake system pressure control), 14 – feathering system, 15 – gondola bearing, 16 – gondola body, 17 – tower”

Source: Schaffarczyk A. *Understanding Wind Power Technology: Theory, Deployment and Optimisation*, Wiley – IEEE Press, New York City, 2014.

### 3. 1 Wind farm efficiency and advantages

The main direct energy volume and efficiency stimulating factor in the wind farm is wind force. Collateral stimulating factors are: climat, or tower height. The gigher it is , the more energy it generates.

Wind farm efficiency, or its maximum power depend on wind turbine size. This, however, does not describe the general rule, as there are other factors influencing power station work, as well as adaptation of various models of stations to different wind forces. That's why two turbines of similar size may have even 100% different power. Turbine size does

not directly affect power, which makes one question necessity of maintaining similarities in turbines sizes and production costs, since they may generate even twice less power. Lower powered turbines (kW) per m<sup>2</sup> are adapted to slower winds, so their power level does not constitute a disadvantage in slow wind areas.

Advantages of wind farm: [Walker R.P., Swift A., 2015, p. 354]

- It may be used in separated power grids, which means that power does not need to be sent to power plant first and it may be used instantly.
- Wind, being a free and renewable power generation source does not have any harmful impact on environment, or can even help to decrease emission of nitrogen, carbon and sulphur oxides and dusts to the atmosphere (air quality improvement).
- Wind resources are inexhaustible and they can replace gas, oil or coal as energy source.
- In comparison to other RES it has enormous transformation ability (wind force into power) which is appr. 60%. Such capacity is dependent on technology applied.
- Wind farms may be built almost everywhere ( idle agricultural lands, coasts, deserts, open sea and small turbines may be assembled even on bridges, advertising banners, buildings roofs, both, residential and business). Wind farms may be also a touristic advantage.
- Wind energy may be a good solution for remote, wild zones, on ships and other locations off the grid.
- Wind farms create jobs: 1000 MW of installed power gives jobs to 5.000-7.000 people.
- Wind farms lands may be agriculturally used simultaneously.
- Wind farms do not generate waste.
- Wind generated energy may increase energy safety (independence from foreign energy resources).
- Wind farm maintenance cost is low.
- Power surplus may be sold, which means profits from its use.

### **3. Eco-technologies as the factor increasing competitiveness of an enterprise**

This study includes an example of a local bakery, very popular, because of its qualitative and vast offer. The bakery is active for 20 years and is a local leader. Among 276 random

customers a survey has been performed, aimed at learning following research information scopes:

### **3.1. Customers' ecological preferences**

In order to learn the customers' ecological preferences the individual surveys contained following questions:

- Are you a member of environment protection organisation/group? (including active participation in Internet discussion forums, or Facebook groups on environment protection).
- Do you sort your waste?
- Have you ever heard of clean energy and eco-technologies in production?

### **3.2. Identification of environment supporting activities on competitiveness**

The relation between environment protection and competitiveness can be analysed on the basis of following questions:

- Do you choose environmentally friendly packages in your shopping?.
- Do you think, that buying green products considerably improves environment protection?

### **3.3. The verification of thesis, that eco-certificates determine the product's competitiveness.**

The above thesis has been verified by following questions:

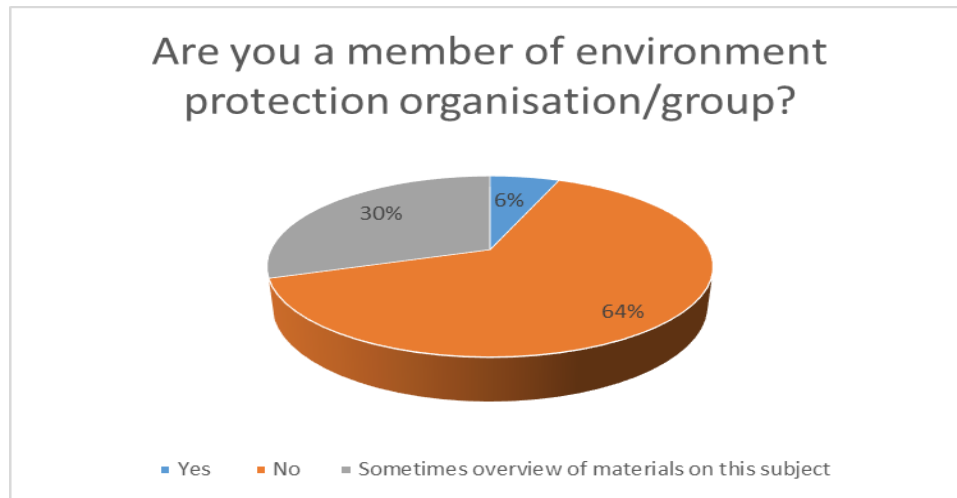
- Do you choose shops and products with green certificates?
- What is your main factor in your shopping in the bakery?

### **3.4. The verification of thesis, that wind turbine is a good advertisement**

The below questions are aimed at specifying, whether wind turbine may constitute a production advertisement:

- Would you buy a 10% more expensive product, but made with use of renewable energy?
- Having two bakeries with identical prices, would you choose a classical shop A, or eco-certified, environmentally friendly shop B?
- Could you go a longer distance to shop in an environmentally friendly bakery, despite that there would be other ones closer? (similar proces and offer in all of them)

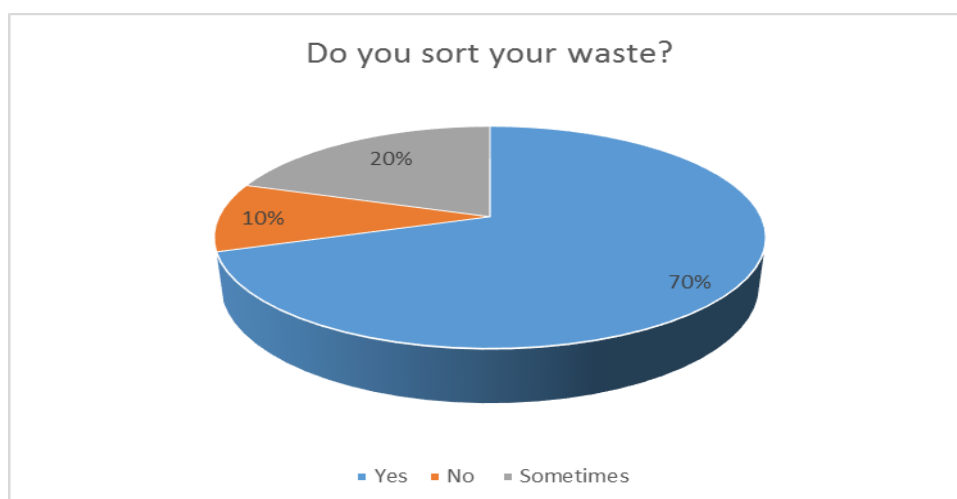
**Figure.2. Answers for question 1 - Are you a member of environment protection organisation/group? (including active participation in Internet discussion forums, or Facebook groups on environment protection).**



Source: Own elaboration.

This extremely important questions verifies the objectiveness of the question. The respondents were completely random and it could happen, that survey internet link got somehow to some environmental forum, which would completely compromised its objectiveness. Only 6% of respondents belong to environment protection organisations / groups, 30% of respondents sometimes gets acquainted with these kinds of materials, and even 64% has no connection to any environment protection organisation or group, nor have any access to such kind of knowledge. In the Internet age it is difficult to avoid information and articles on ecology, as they are found often together with other news and we randomly get to contact with them.

**Figure.3. Answers for question 2 - Do you sort your waste?**

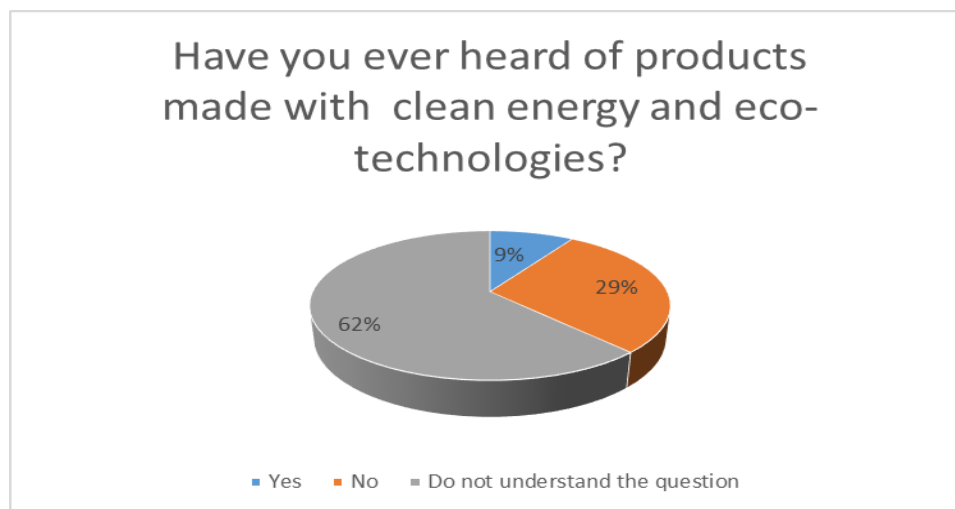


Source: Own elaboration.



The second question shows how many of respondents sort their waste, and the result is very inconsistent with the one we obtained for the third question. In other question only 23% noticed eco-packaging, which makes them environmentally aware, but in fourth question, even 70% admitted to sort their waste. Can you ignore eco-packaging and sort your waste? These two attitudes are completely opposite, still the result should not surprise us. Poles are friends of the environment, whenever it brings profits, we need to pay more for disposal of unsorted waste, which makes only 10% of the respondents not to sort them, and 20% to sort them periodically. One may say, that our wallet is hugely connected to our eco-awareness.

**Figure.4. Answers for question 3- Have you ever heard of products made with clean energy and eco-technologies ?**



Source: Own elaboration.

This question was to precise the group we work with. This was a single choice question. The following chart presents the percentage of different answers.

The question leads us to a conclusion, that even 62% of respondents is aware of eco-products. The question is rather complex, contains specialist terms, which are not explained, which may be a problem for respondents to understand its essence, however only 9% of them did not understand the question. Considering diversification of respondents' age and education, this is a quite good result, confirming high ecological awareness, still we cannot exclude, that the respondents who have not understood the question chose NO as an answer, which reached 29%. Further questions will help us to clear this situation.

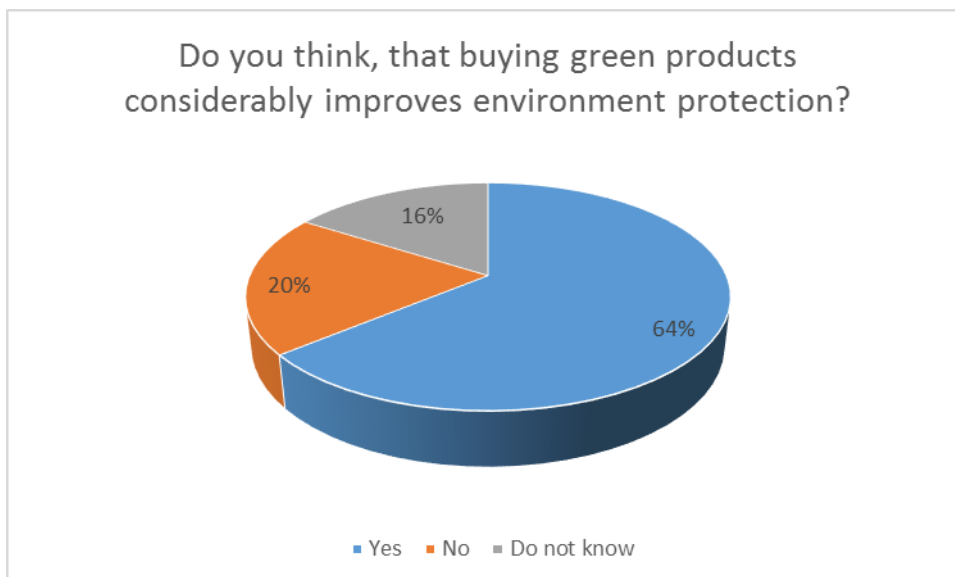
**Figure.5. Answers for question 4 - Do you choose environmentally friendly packages in your shopping?**



Source: Own elaboration.

The fourth question analysis proves, that 23% of respondents turns attention to eco-packaging, and 44% does that periodically. Unfortunately, even 33% turns no attention to eco-packaging, despite they are used just for a moment and quickly become a harmful waste. Nevertheless, it is worth investing in green packaging in the shops, as only  $\frac{1}{4}$  considers this irrelevant.

**Figure 6. Answers for question 5 - Do you think, that buying green products considerably improves environment protection?**



Source: Own elaboration.

The fifth leads us to an extremely important conclusion, as 64% agrees that buying eco-products increases the environment protection, so it means that we are aware that our every day choices influence the environment. Only 20% disagree with that thesis and 16% has no sufficient knowledge to give an answer. Such result would be satisfying to every environment protector and we can certainly confirm, that green products popularity will increasingly grow.

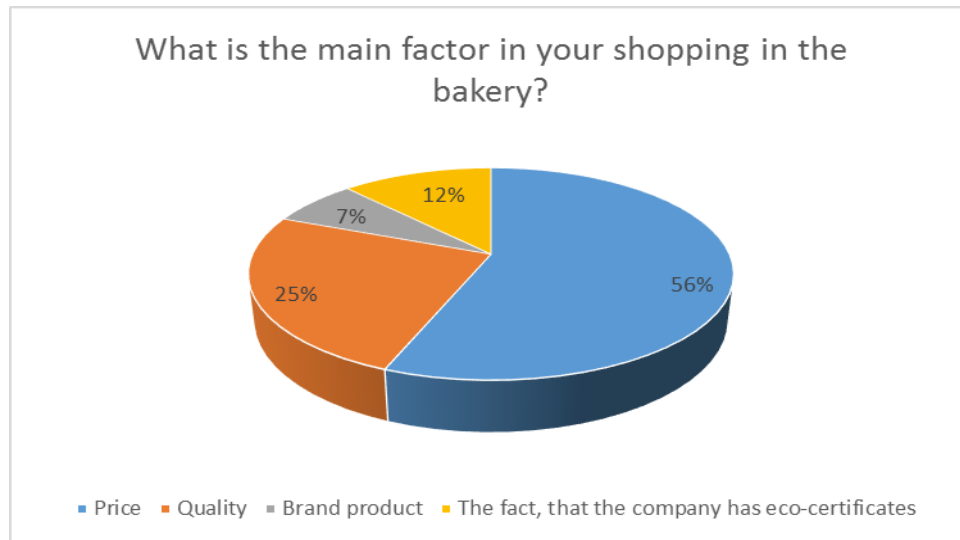
**Figure 7. Answers for question 6 - Do you choose shops and products with green certificates?**



Source: Own elaboration.

Number six shows, that 48% never shops in eco-certified stores and does not buy products of this kind, only 9% chooses eco-certified shops and products, and 43% does it sometimes. I wonder, why 43% gave the „sometimes” answer, if even 64% of fifth question respondents considered eco-aware shopping important for the environment, which makes one think, that there are more important factors influencing our choices than concern for the environment?

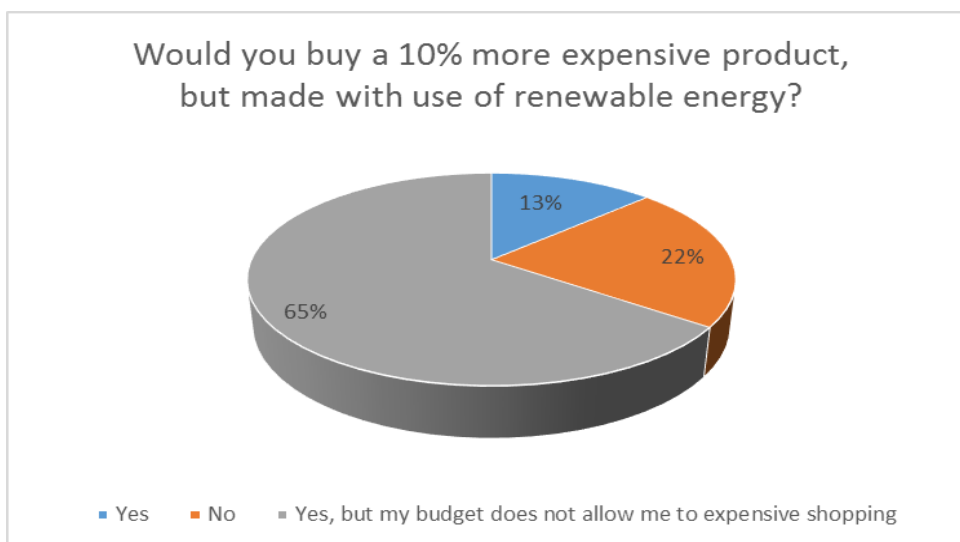
**Figure 8. Answers for question 7 - What is your main factor in your shopping in the bakery?**



Source: Own elaboration.

Analysis of the 7<sup>th</sup> question leaves no doubt, that price remains the main factor in one's bakery shopping, which constitutes 56% of respondents, with quality on a second place, which was 25%, brand loyalty is a driver for only 7%, and eco-certificates are important to 12%. Low brand loyalty share is interesting, as this draws a major line of difference between food and clothing industries, as brands, as brands are much worse recognisable in bakery.

**Figure 9. Answers for question 8 - Would you buy a 10% more expensive product, but made with use of renewable energy?**



Source: Own elaboration.

Question 7 was important, as there we analysed the main shopping choices creating factor, which in bakery appeared to be the price, which confirmed, that Poles are reluctant to buy more expensive eco-products, as the price, not eco-awareness is their main motive. In the country, where majority of population faces financial problems, low price is vital and question 8 confirmed that thesis. Only 13% of respondents would pay 10% for a product made with renewable energy, and even 65% wished to to buy more expensive, eco-friendly products, being forced to refuse to buy them because of the financial limits. This 65% of respondents remains extremely important to me, as it shows us the direction of activity, aimed at eco-technologies which do not raise the product price and will help 65% of people be actively concerned about the environment. The following question was to verify, whether my assumption was right.

**Figure 10. Answers for question 9 - Having two bakeries with identical prices, would you choose a classical shop A, or eco-certified, environmentally friendly shop B?**

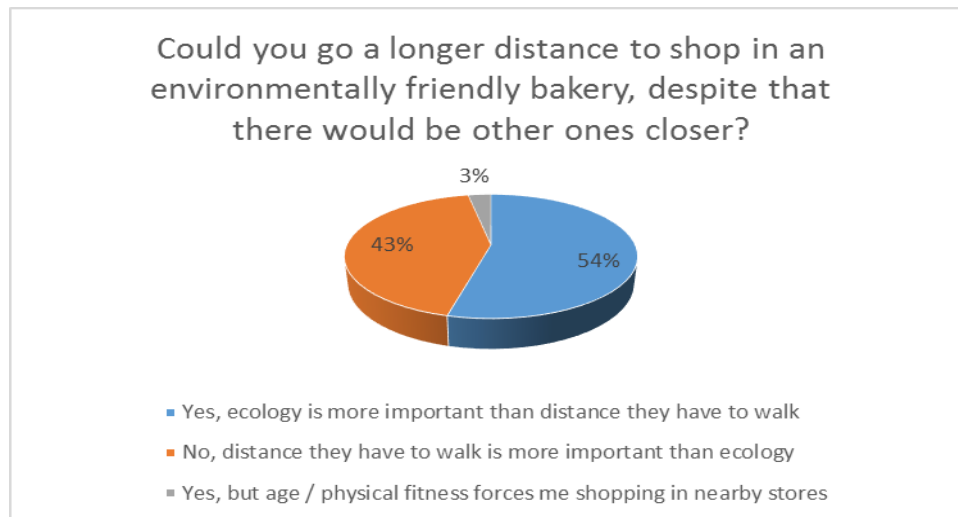


Source: Own elaboration.

Question 9 is an ideological one, providing purely laboratorial shopping conditions. There are two stores with identical prices and products and the only difference is, that the store B is eco-certified and store A is not. In such favourable circumstances, even 75% choose store B, and 7% store A, and for 18% certificates were irrelevant. The question proves, that 7% who could potentially choose store B treated Green Leaf symbol as a decoration only, and it was insignificant to them, whether this store represented an eco-aware company. Knowing Polish reality, one may doubt, whether eco-certificates are not simply another marketing trick aimed at sales increase, gaining of which is simply related of periodical fees such company needs to pay, just how it is with the Reliable Company certificate. The Ministry of Environment should take measures to increase environmental awareness of Poles, to make them learn, that eco-certificates are reliable and make great

contribution to the protection of environment, which will be inherited by our children and grandchildren.

**Figure 11. Answers for question 10 - Could you go a longer distance to shop in an environmentally friendly bakery, despite that there would be other ones closer? (similar proces and offer in all of them)**



Source: Own elaboration.

Question 10 analysis proves, that 54% of respondents considers environmental care more important, than distance they have to walk and they are ready to sacrifice more time to make shopping in a bakery store, which is eco-aware, provided that the prices and quality of the products are similar, and even 43% would choose the traditional shop because it is closer. One factor in question 10 needed to be changed – larger distance to an eco-store and eco-enthusiasts number dropped by 21%. This questions proves how important all shopping circumstances are and how many questions we need to give to obtain an objective response. The questions usually similar one to another give us quite.

## Summary

The Human Lean Green concept includes environmental aspects. The actions taken by organizations that are aimed at reducing a negative effect of these organizations on the environment are often indicated by limiting the consumption of resources, such as materials, energy, water or gas. The proceeding degradation of the environment in many dimensions has been an obvious fact for a long time. The shrinking natural resources of the Earth, the deepening of the greenhouse effect and increasing pollution are one of the results of development, economic changes, and, above all, the irrational human behaviour. The excessive consumption and actions aimed at making a quick profit lead mankind to self-destruction and put the environment and economic development against each other. Therefore, searching for a balanced development which would combine and respect both the requirements of environmental protection and technological progress is

an enormous challenge nowadays and requires taking immediate actions. The ecological consciousness of the Polish society is increasing. According to the research, environment-friendly activities constitute an essential factor that determines the number of clients. Visible environment-friendly actions make an important criterion for choosing between one company and the other. The factor that limits the environment-friendly behaviour of customers refers to the fact that the products of environment-friendly companies are often more expensive than of the others.

## References

- ADAMCZYK J. Społeczna odpowiedzialność przedsiębiorstw, Wyd. PWE, Warszawa 2009.
- ADAMCZYK J., NITKIEWICZ T., Programowanie zrównoważonego rozwoju przedsiębiorstw , PWE, Warszawa 2007.
- DAS J.C. Power System Harmonics and Passive Filter Designs, Wiley – IEEE Press, New York, 2015.
- DOLLIVER M., *Thumbs Down on Corporate Green Efforts*, Adweek, 2010, August.
- ENGARDIO P., Beyond the Green Corporation, BusinessWeek, 2007, January.
- FIJAK M., GORGON P., Energia odnawialna oraz perspektywy jej rozwoju w Unii Europejskiej [w:] Zarządzanie przedsiębiorstwami a zrównoważony rozwój, red. I. Krawczyk –Sokołowska, A. Lemańska – Majdzik i.in., Sekcja WWZPCz, Częstochowa 2014.
- JANIKOWSKI R. Zarządzanie antropogresją. W kierunku zrównoważonego rozwoju społeczeństwa i gospodarki, Difi, Warszawa 2004.
- LIKER J.K., CONVIS G.L. Droga Toyoty do lean leadership, MT Biznes, Warszawa 2012.
- LIKER J.K., MEIER D.P. Droga Toyoty Fieldbook. Praktyczny przewodnik wdrażania 4P Toyoty.MT Biznes, Warszawa 2011.
- MAJECKA B., Kształtowanie zachowań warunkujących zrównoważony rozwój przedsiębiorstw, [w:] Zrównoważony rozwój przedsiębiorstwa a relacje z interesariuszami, red. H.Burdulak, T. Gołębowski, SGH w Warszawie - Oficyna Wydawnicza, Warszawa 2005.
- Poland's Energy Policy till 2030  
przedsięwzięcia”
- The Green Book European Strategy of Sustainable, Competitive and Safe Energy, www.cire.pl.
- WALKER R. P., SWIFT A., Wind Energy Essentials: Societal, Economic, and Environmental Impacts, Wiley – IEEE Press, New York, 2015
- ZABŁOCKI G., Rozwój zrównoważony . Idee, efekty, kontrowersje. Wyd. Mikołaja Kopernika, Toruń, 2003.
- Zielona Księga a Europejska Polityka Energetyczna – Raport, Anna Konarzewska, Bezpieczeństwo Narodowe I/2006.